Poster: A Method for Holistic Evaluation of Sustainable Buildings of the Future

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A Method for Holistic Evaluation of Sustainable Buildings of the Future

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Project description Interest in quantitative assessment of building performance has increased through the last decades in line with the technical and practical development of sustainable buildings. Now, contours of a more holistic approach to sustainable buildings begin to emerge and the increasingly holistic approach calls for new ways to assess and evaluate our buildings, not solely based on quantitative means but particularly based on qualitative means. The question emerges of *how we can determine and assess both quantitative and qualitative qualitative aspects of sustainable buildings without deducting the value of either of them.*

Research set up The research project consists in measuring, registering, analyzing and comparing seven houses and occupants – through *both* quantitative *and* qualitative studies. The quantitative performance is mapped though measurements on the technical performance in relation to energy and indoor climatic conditions. Qualitative performance is mapped through measurements on occupants' registered and verbalized experiences and through observation, scenario-studies, registration and daylight description.

Research hypothesis Quantitative measurements on sustainable homes can help demonstrate low energy consumption and energy production by passive and renewable sources, healthy indoor climate and interaction with the surrounding environment.

Research hypothesis Qualitative measurements on sustainable homes can help demonstrate that its occupants experience benefits of a healthier indoor climate and effects on the surrounding environment and to discover increasing awareness of their energy behavior.

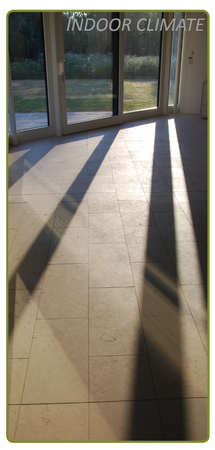
Research hypothesis Measuring qualitative and quantitative aspects of sustainable homes and their occupants makes it possible to identify what parameters are central to develop sustainable buildings of the future and design a method for holistic evaluation of these houses.

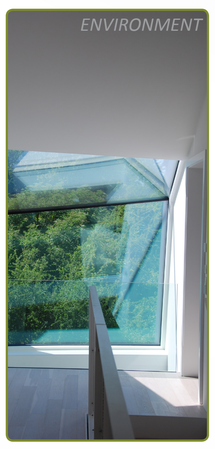
How can we measure our buildings by their ability to improve our lives?

Research design and methodology The project focus on inter-disciplinary issues related to developing sustainable buildings of the future. The research design is based on multi-disciplinary sciences stretching from phenomenology and social science theory to measurements relying on a natural scientific approach. The various scientific approaches treat the same project problem but with different theories and methods thus illuminating the issues from different perspectives. The strategy is based on a Mixed Methods Research approach (Creswell 2006) that equally considers quantitative and qualitative aspects and data. Case Study Research (Yin 2009) methodology handles each house as an individual case in an embedded-multiple case setup. After data collection cross-comparison through comparative studies will provide for indentifying structures, sub-structures and miss-structures in the data extent. The structures are intended to indicate what parameters it is suitable to design the evaluation method on.

How can we determine what parameters to evaluate by measuring the performance of occupied experimental sustainable homes?

What is measured? Data and information is a necessity in order to analyze and identify what parameters are central to measure and evaluate. This implies the need for identification of what methods to use for measuring quantitative and qualitative aspects of sustainable homes. Following the Active House vision measurements will be on Energy, Indoor climate and Environment.

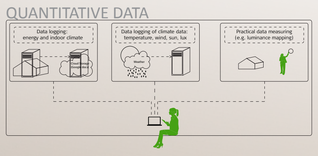




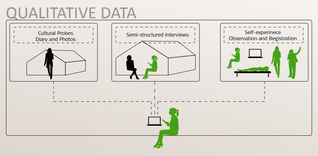
Hypothesis *By compilation of methods from natural science and artistic and humanistic disciplines it is possible to design a frame on how to measure quantities and qualities in sustainable homes.*

How is measured? MEASURING QUANTITATIVE DATA The intelligent controlling system implemented in the design of the homes is appropriate to use for logging data. The system monitors weather and indoor climate to adjust the house to the occupants' needs. Meters are placed on the system that can log and extract data on energy consumption and production, related to respectively heating and electricity, on weather and physical and behavioral indoor climate. Manual measurements on daylight can support investigations on the indoor climate light parameters, which are the most widely elaborated in the specification and daylight appear as a focal aspect in the Active House vision. MEASURING QUALITATIVE DATA Several qualitative methods can be used for studying the relations between environment, home and occupant. A three-way perspective from a a private, an inter-relational and a professional perspective is to build the qualitative research setup on in a triangulation of methods. The occupants' private perspective is explored through Cultural Probes, inter-relational conversation between occupants and researcher through Semi-structured Interviews, and finally the professionla researcher's perspective by registration, observations, sense exploration and architectural theory.

QUANTITATIVE DATA



QUALITATIVE DATA



Scientific objectives The scientific objective of the projekt is to develop a method to use for holistic evaluation of sustainable buildings of the future. This evaluation method is to be used to support the development of both technical and poetic aspects of future buildings.

Development objectives The scientific documentation of what aspects can be implemented in practice and what values should be weighed in a holistic perspective will provide concrete guidelines to how future buildings can be developed as total design solutions.

Commercial objectives VKR Holding's aim for the project is to communicate and share knowledge developed from the case study houses and thereby support the company vision of bringing daylight, fresh air and better environment into peoples everyday lives.

"Just imagine if the quality of our buildings was measured by their ability to improve life!"

Case study setup

Seven houses - five countries

Seven test families for one year

Measuring the houses and families

Analysing relations between houses and families

Focus on Energy, Indoor Climate and Environment

Living Laboratory From 2008 and three years ahead seven individual experimental houses will be erected in five different European countries in accordance with the Active House vision. All the houses are built with an overall perspective focusing on combining an aesthetic energy-design, high comfort and good indoor climate - while resulting in minimal environmental impacts. The houses are single-family-houses of which one is a renovation project. The seven houses are geographically located across Europe, with two houses in Germany and Austria while one house is built in respectively Denmark, France and United Kingdom. When the houses are built, families move in for a one year period to test how they experience living in and with the houses.

CarbonLight Homes, Ketting, UK
VELUX | New double-row-house

Home for Life, Lystrup, Denmark
VELFAC | New residential house

LichtAktiv Haus, Wilhelmsburg, Germany
VELUX | New double-row-house

Maison Air et Lumiére, France
VELUX | New residential house

Haus der Zukunft, Regensburg, Gernmany
SONNENKRAFT | New residential house

Solar Aktivhaus, Kraig, Austria
SONNENKRAFT | New residential house

Sunlighthouse, Pressbaum, Austria
VELUX | New residential house

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"I only wish that the first really worthwhile discovery of science would be that it recognized that the unmeasurable is what they're really fighting to understand, and that the measurable is only the servant of the unmeasurable; that everything that man makes must be fundamentally unmeasurable."

– Louis Kahn